INTEL® ADVISOR 2019

TECHNICAL PREVIEW OVERVIEW

Features that we need feedback on

Integrated Roofline

- Examine memory traffic at each level of the memory hierarchy on the Roofline chart.

Roofline Compare

- Visualize multiple Roofline charts on the same chart and track your optimization progress.

New and Improved Summary

- More actionable program metrics including memory traffic statistics

Intel® Advisor customizations

- Adjust roofs for multi-socket systems and create custom reports.

Flow Graph Analyzer

- Workflows: Create, Debug, Visualize and Analyze

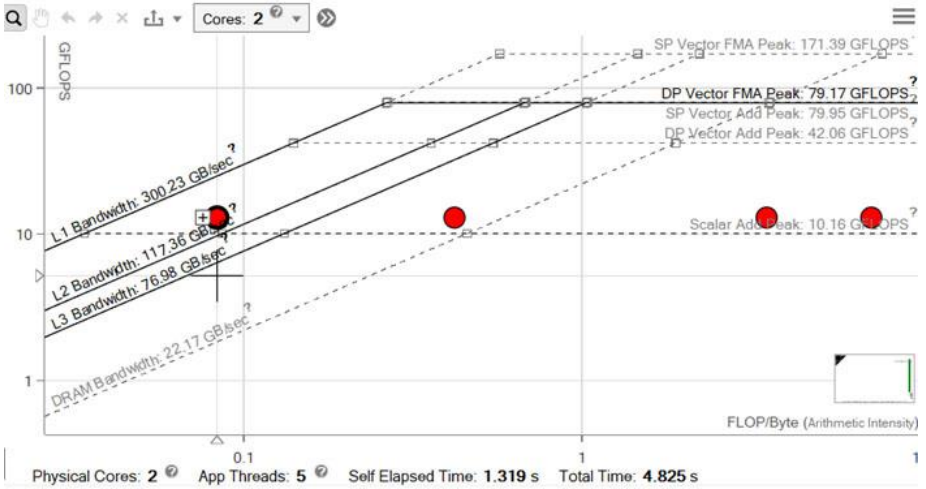
INTEGRATED ROOFLINE MODEL

Understand how the memory reacts to your optimizations

Integrated Roofline model

In the Intel® Advisor Integrated Roofline chart the Arithmetic Intensity and memory traffic for each level of the memory hierarchy is represented separately.

You can visualize the levels that need further optimization.



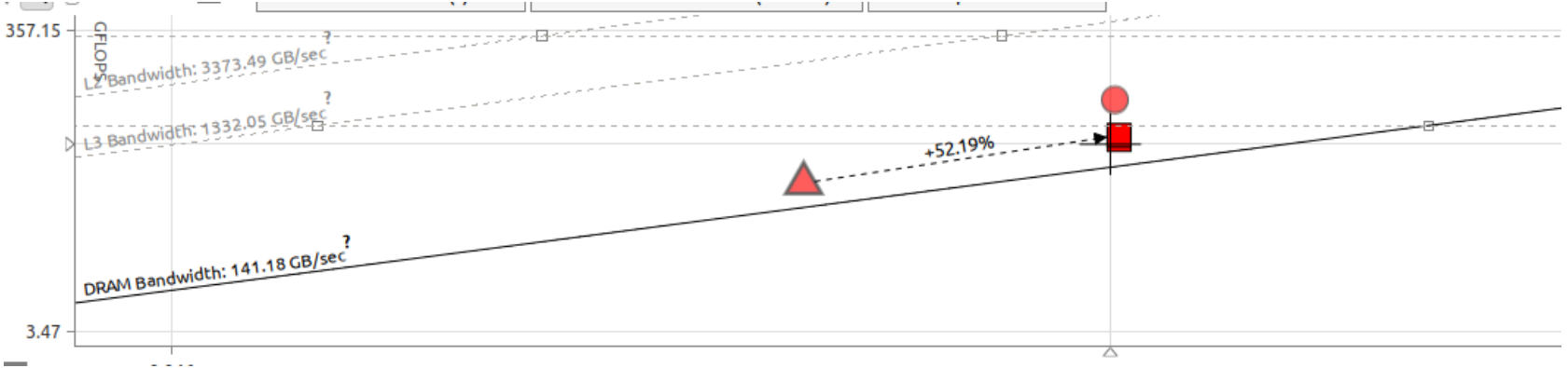
ROOFLINE COMPARE

Visualize multiple roofline charts on the same graph.

Roofline compare

Visualize multiple roofline charts on the same graph.

Test optimization strategies and see how much progress your are making.



NEW AND IMPROVED SUMMARY

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New and Improved Summary

Program metrics

Elapsed Time	7.71s
Vector Instruction Set	AVX2, AVX
Number of CPU Threads	36

GFLOPS	61.89
GFLOP Count	477.428
FP Arithmetic Intensity	0.30422
GINTOPS	1.29

Overall metrics

Performance characteristics

Metrics	*Total*	
Total CPU time	167.50s	100%
Time in **2** vectorized loops	109.30s	65.3%
Time in scalar code	58.20s	34.7%

Vectorization Gain/Efficiency

Vectorized Loops Gain/Efficiency	6.87x	86%
Program Approximate Gain	4.83x	

Ratio of vectorized/unvectorized code

OP/S and Bandwidth

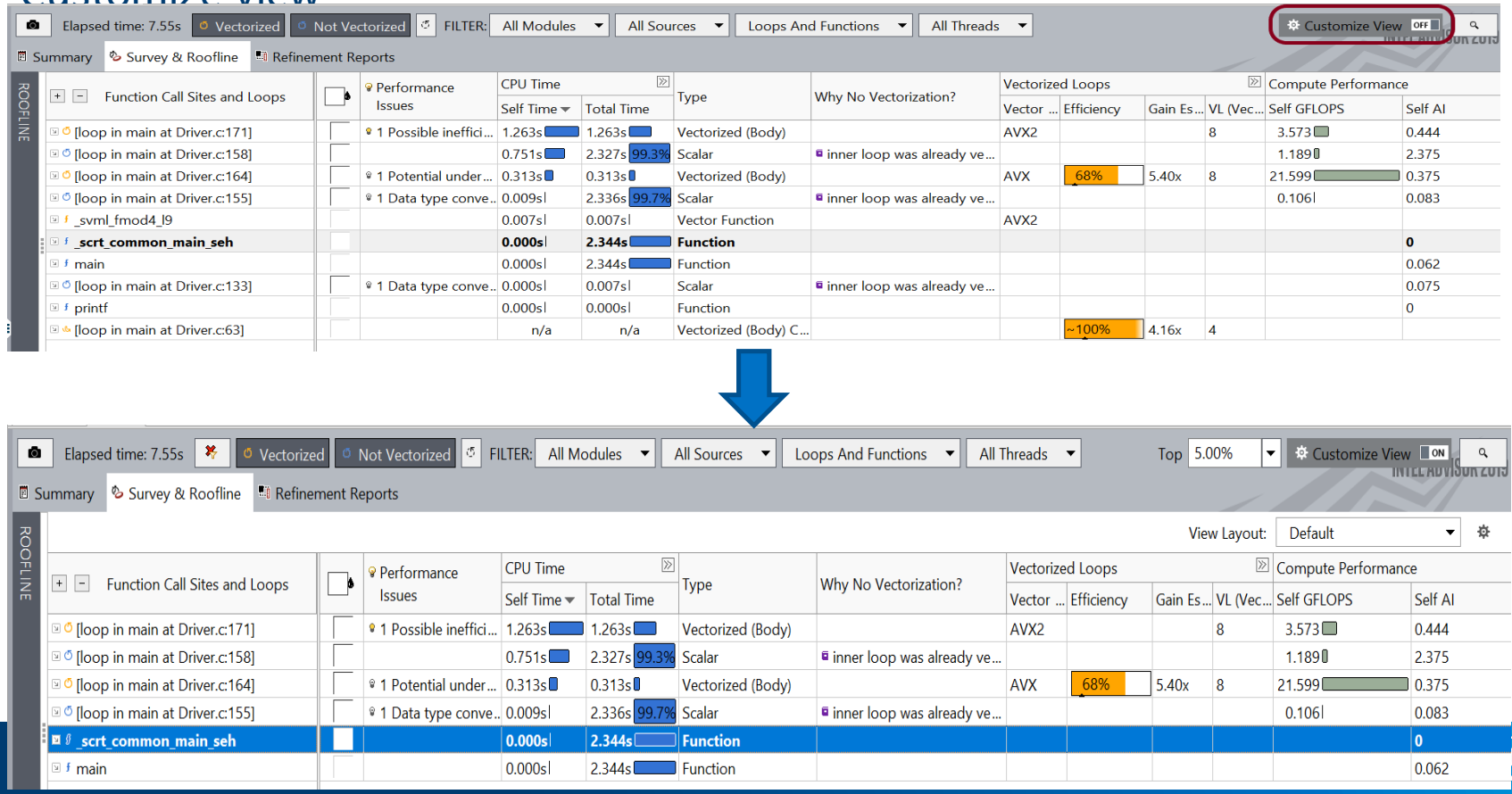
Effective OP/S And Bandwidth		*Utilization*		*Hardware Peak*
> GFLOPS	**61.89**	4.7%	out of	1318 (DP) FLOPS
		2.3%	out of	2646 (SP) FLOPS
> GINTOPS	**1.292**	0.19%	out of	662.8 (Int64) INTOPS
		0.097%	out of	1326 (Int32) INTOPS
> CPU <-> Memory [L1+NTS GB/s]	**203.4**	1.6%	out of	12370 GB/s [bytes]
> L2 Bandwidth [GB/s]	**105.9**	3.1%	out of	3374 GB/s [cacheline bytes]
> L3 Bandwidth [GB/s]	**69.07**	5.2%	out of	1332 GB/s [cacheline bytes]
> DRAM Bandwidth [GB/s]	**14.88**	11%	out of	141.2 GB/s [cacheline bytes]

Informations on Operations and Memory transfers

CUSTOMIZE INTEL® ADVISOR

Column Configurator

Customize view



FLOW GRAPH ANALYZER

Flow Graph Analyzer

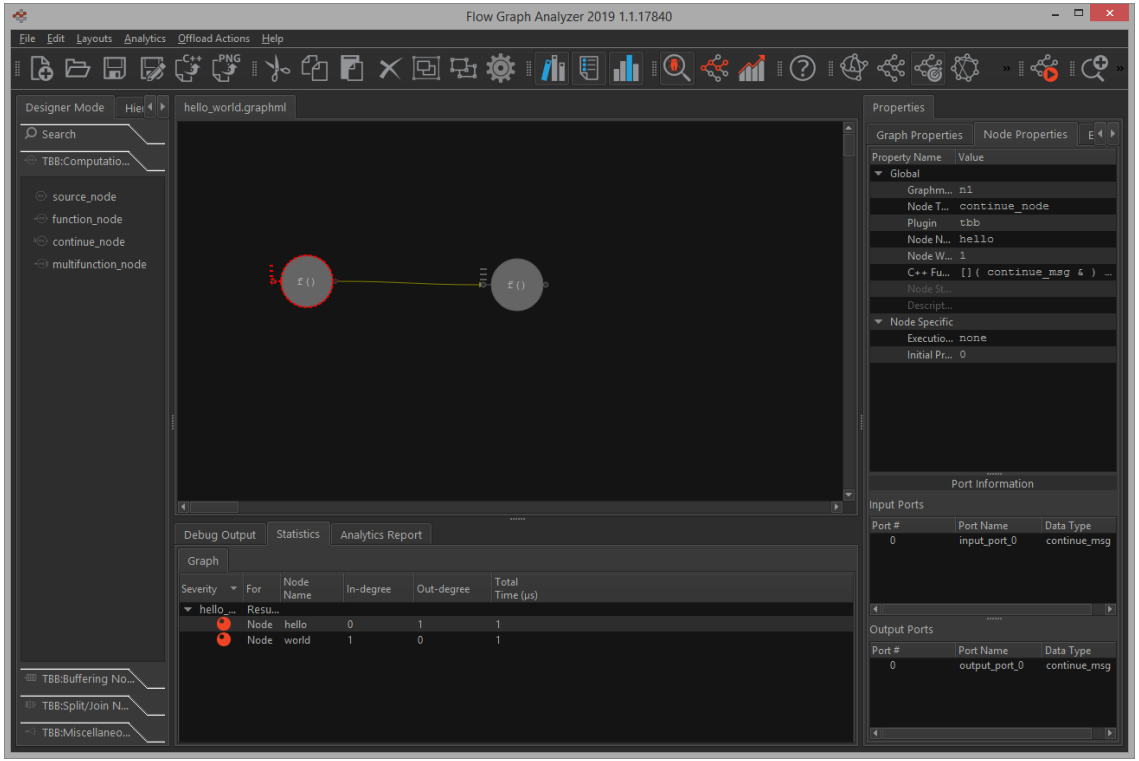
Workflows: Create, Debug, Visualize and Analyze

Design mode

- Allows you to create a graph topology interactively
- Validate the graph and explore what-if scenarios
- Add C/C++ code to the node body
- Export C++ code using Threading Building Blocks (TBB) flow graph API

Analysis mode

- Compile your application (with tracing enabled)
- Capture execution traces during the application run
- Visualize/analyze in Flow Graph Analyzer
- Works with TBB and OpenMP



BACKUP/HOWTO

How to configure Integrated Roofline

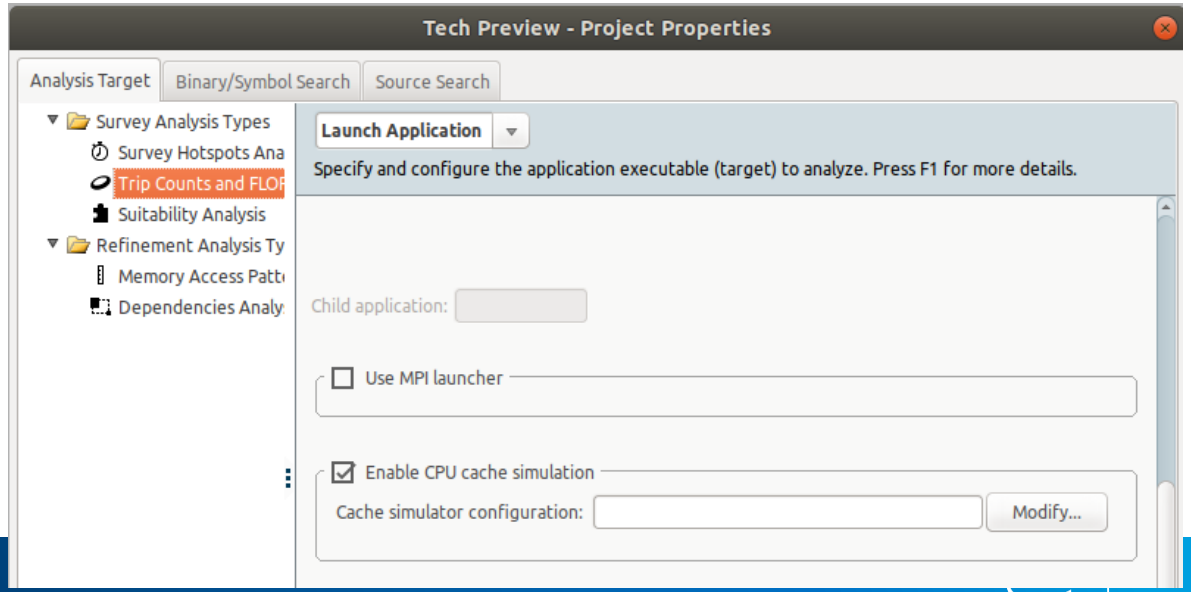
Before launching Intel® Advisor, run:

- $ export ADVIXE_EXPERIMENTAL=int_roofline

Run the GUI

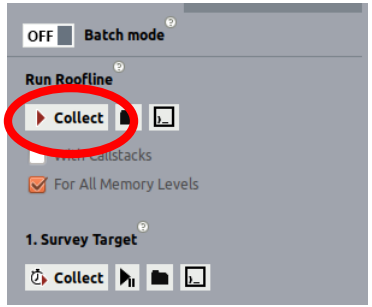
- $ advixe-gui

Configure the GUI to enable cache simulation



How to set it up (GUI) ?

Run the Roofline analysis by clicking on **Collect**



How to set it up (command line) ?

Before running an analysis, run:

- $ export ADVIXE_EXPERIMENTAL=int_roofline

Run the survey

- advixe-cl -collect survey ……. -- ./my_application param1 param2 …

Run the trip count and flop

- advixe-cl –collect tripcounts -flop -enable-cache-simulation ……. -- ./my_application param1 param2 …

Visualisation of the result

If you ran the command line, you need to do the following.

Before running the GUI, run

- $ export ADVIXE_EXPERIMENTAL=int_roofline

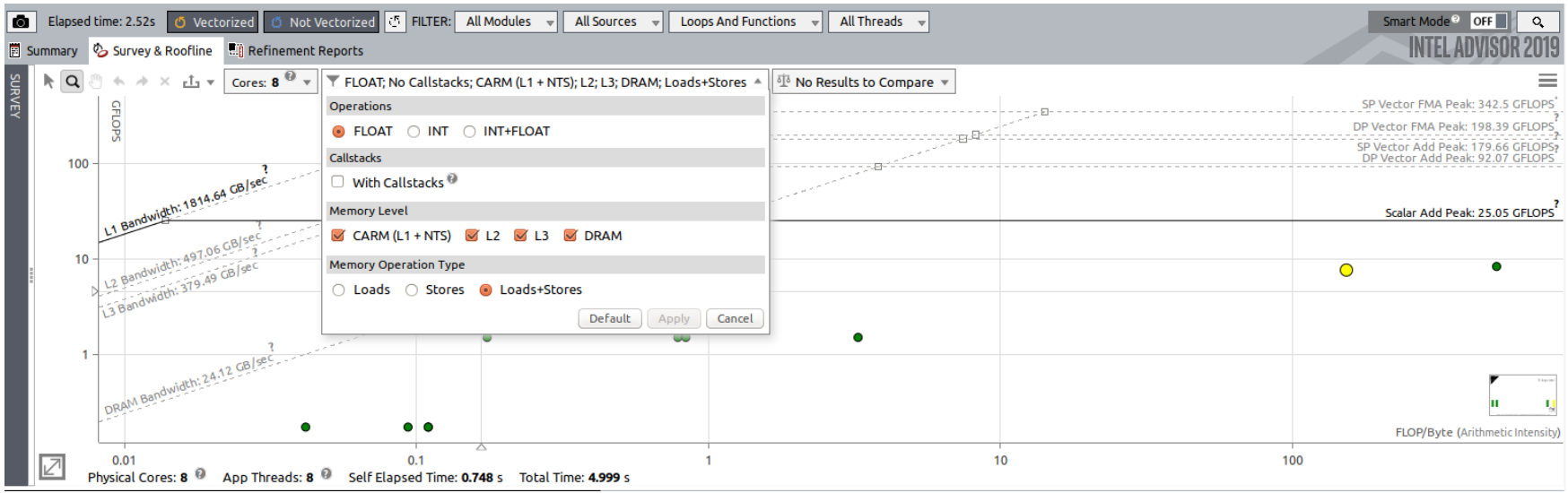
Open the GUI and your project

- $ advixe-gui

Browse to your project and open it

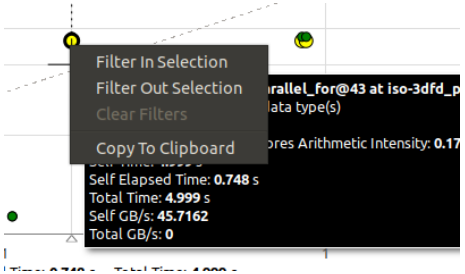
How to display the Integrated Roofline chart

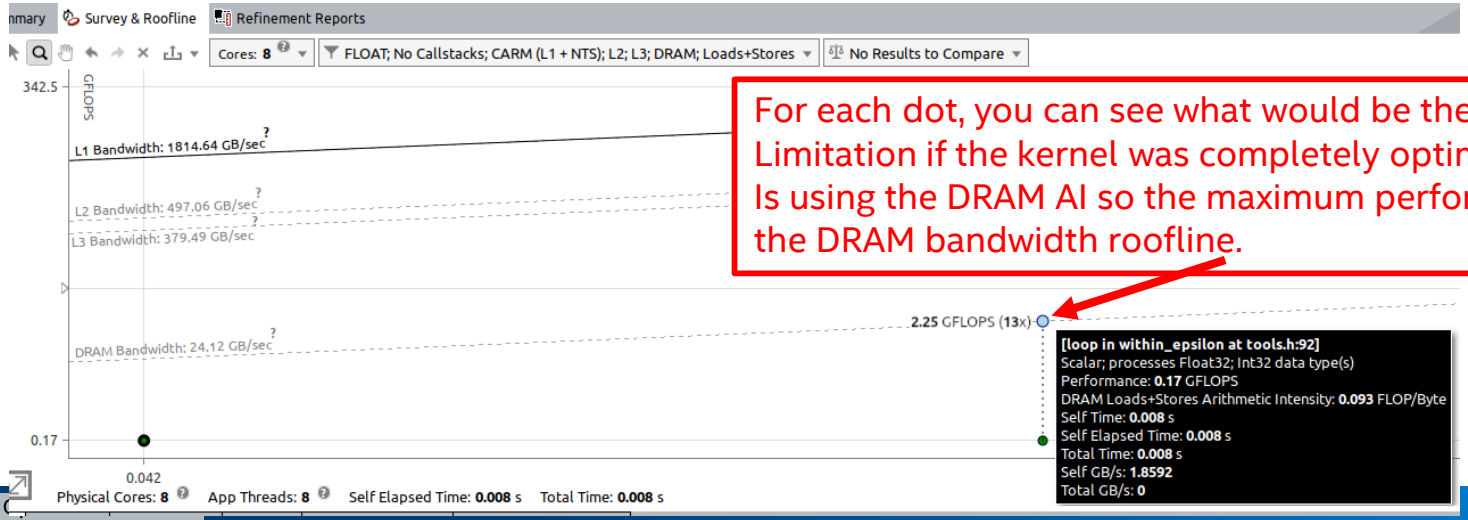
You can select which memory level you want to display. Each memory level selected display an additional dot for every kernel. Each dot of the same kernel has the same performance but different Arithmetic Intensities. Here we selected CARM, L2, L3 and DRAM



Filtering to make it more readable

Right click on a dot and select
Filter In Selection to filter on this kernel

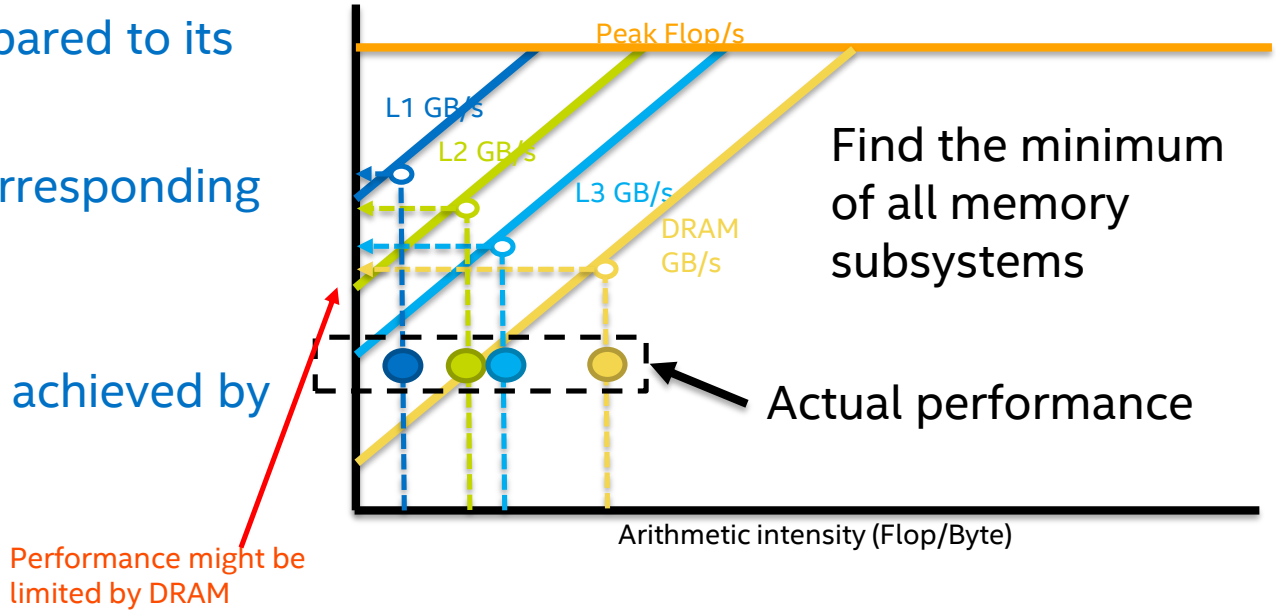




For each dot, you can see what would be the performance Limitation if the kernel was completely optimized. This dot Is using the DRAM AI so the maximum performance must be read the DRAM bandwidth roofline.

How to interpret your current limitation?

- Each dot must be compared to its corresponding roof
- A dot can't break its corresponding roof
- A first idea of potential performance can be achieved by projections



Identifying a bottleneck due to bandwidth

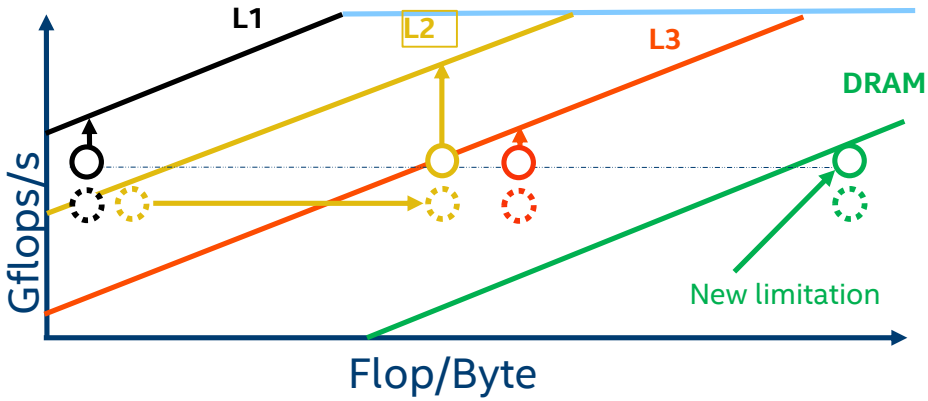
Since no dot can break its corresponding roof, one that is pressed against it is a bottleneck limiting the performance of the loop/function.

In this example, the yellow L2 dot was the bottleneck.

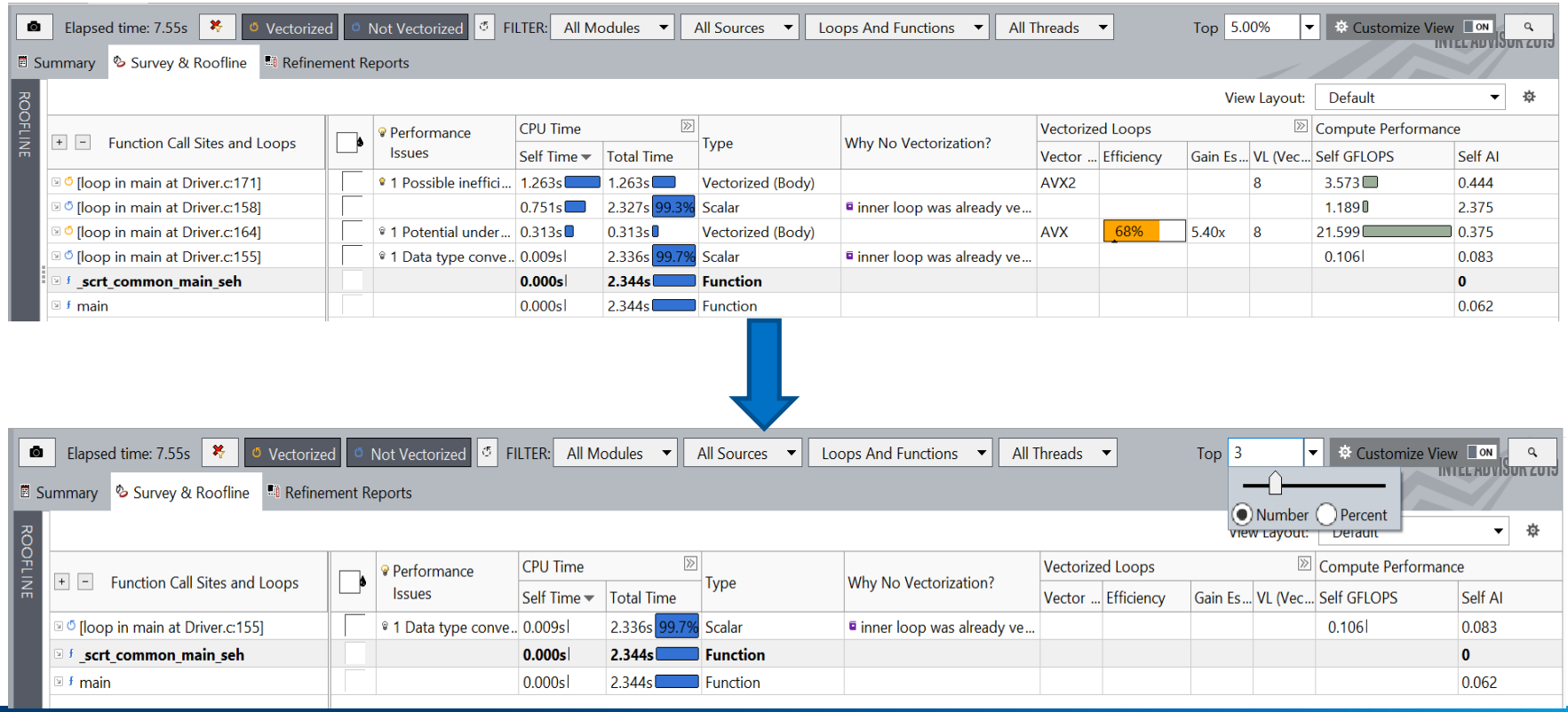
Memory optimizations increase the AI, giving the dot more headroom.

This allows performance to increase until another bottleneck is encountered.

Compute bottlenecks are identified in the same way as on the CARM.



Changing the number value of the Top



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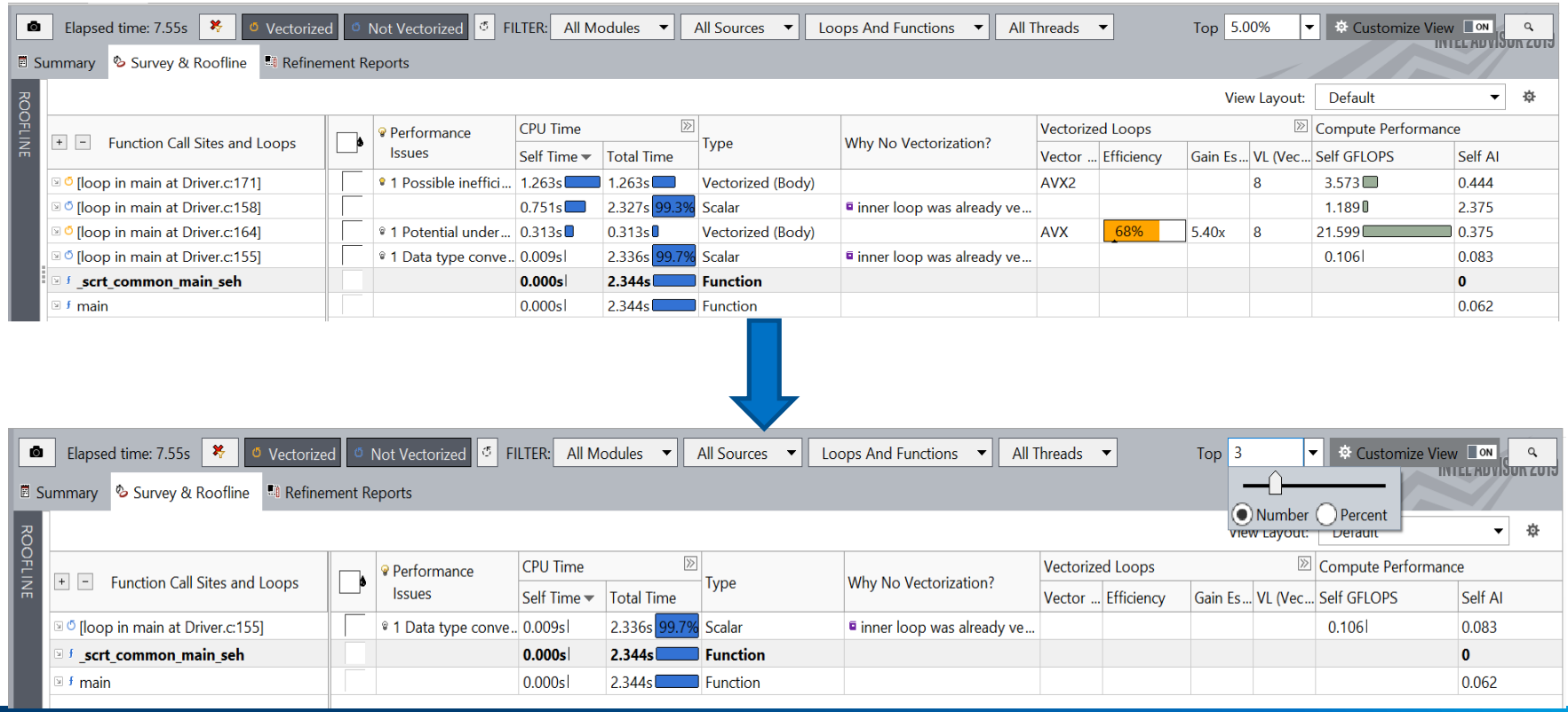
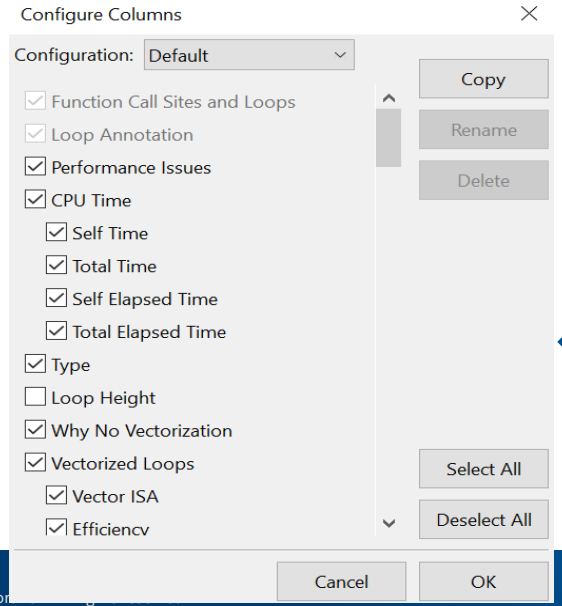
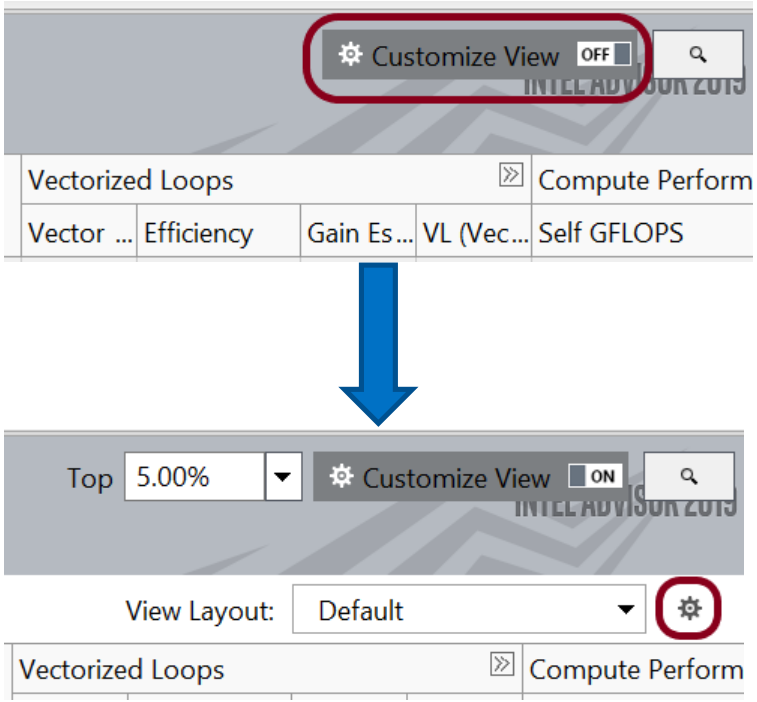


Changing Column Layout

Click the Customize View toggle button

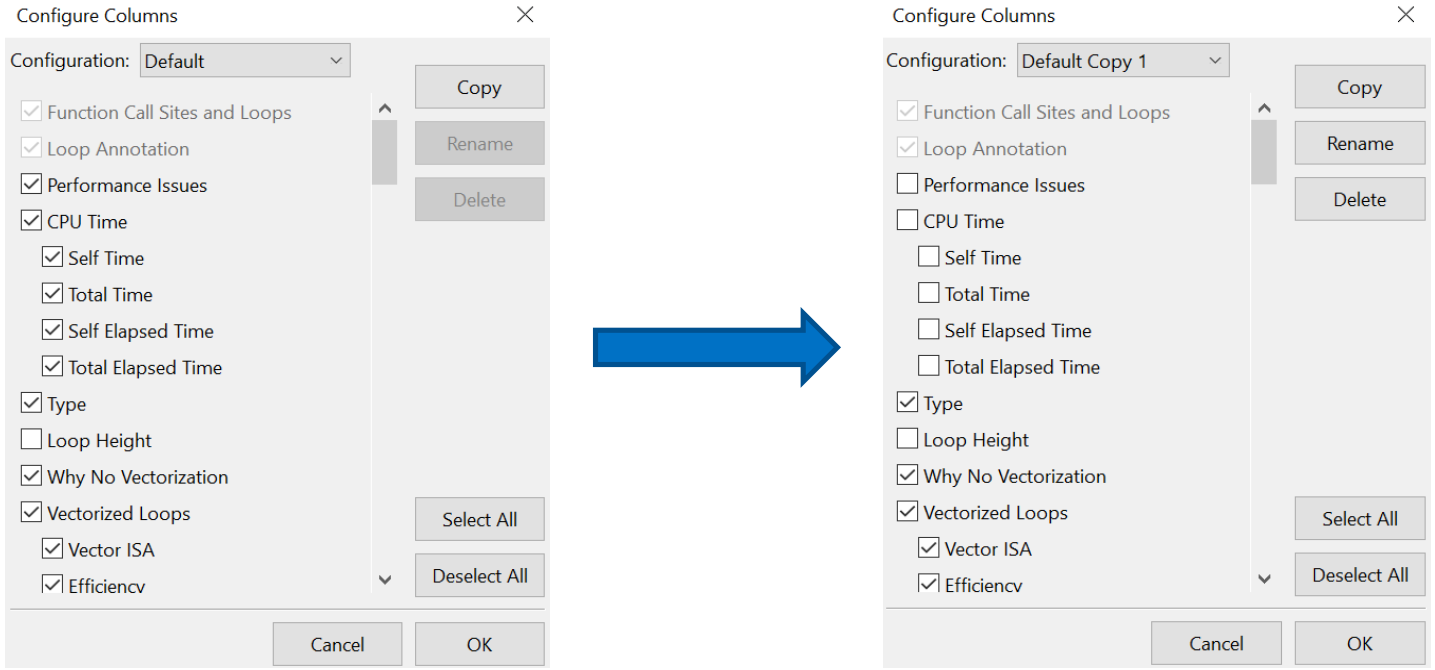
Click the Gear icon next to Default button which opens the following dialogue





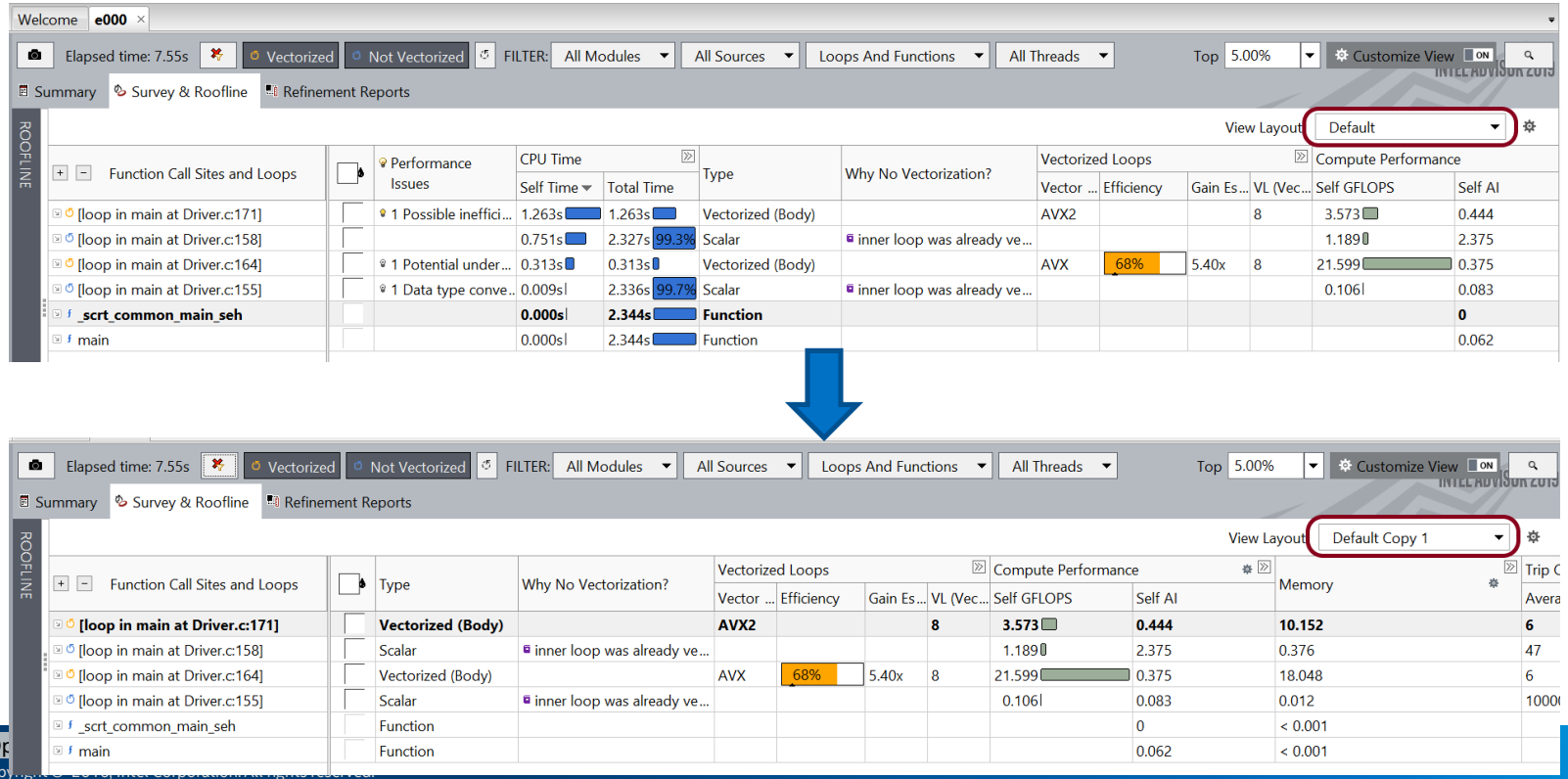
Changing Column Layout

- Selecting/Unselecting columns from the menu creates a new view layout



Changing Column Layout

- Unselecting the Type and CPU Time creates a new Column layout



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